Admission avoidance & troubleshooting

JAY/EQUIP12

Points for discussion

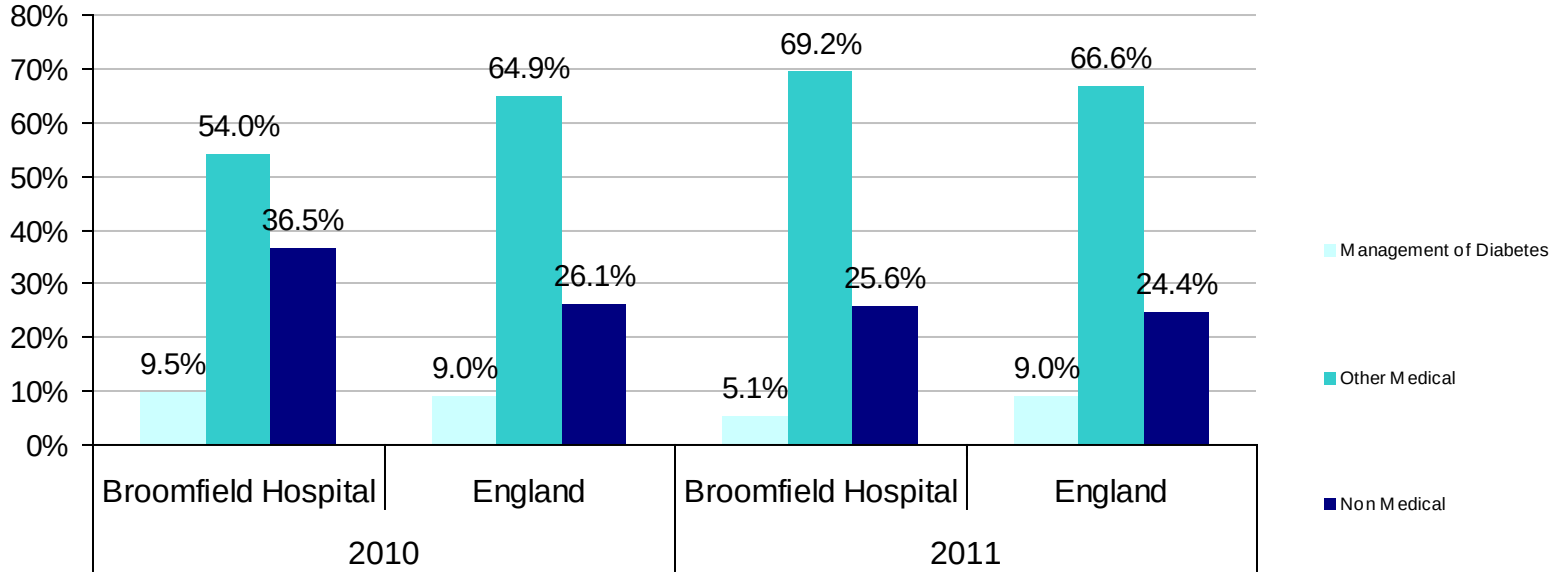
- What brings people into hospital?
- What care should they receive to avoid admission?
- When is admission necessary?
- What should happen when a patient is diagnosed with Type 1 and Type 2 diabetes?
- Troubleshooting HbA1c – option appraisal
- Updates on DKA, ACS
- What support is available?
- Key messages

Reasons for admission

- Non diabetes related
- HONK
- New Type 1 in DKA
- Known Type1 in DKA(drug alcohol abuse)
- Hypoglycaemia
- Hyperglycaemia

Who is admitted:National diabetes in-patient audit 2011

Reason for admission: 5.1% of patients admitted for diabetes, 69.2% for medical reasons, 25.6% non -medical



Other key findings 2010 and 2011

- Appropriate BG monitoring 6.7/7 compared to 6.2/7 in 2010, good days 4.4/7 compared to 3.9/7
- Diabetes team visit 53.8% compared to 28.3% in 2010
- Medication errors 16.7% this year compared to 36.1% in 2010
- Prescription errors reduced from 31.1% to 16.7% includes “not signed for”
- Taking control 83.3% from 74.3%
- Diabetes awareness 92.3% but only 50% enough staff knowledge
- Satisfaction with care of their diabetes 78.6% from 75.6%

Admission avoidance

What care should patient's receive to avoid admission?

- New Type 1 suspected: urgent same day referral to diabetes team at Diabetes centre by phone backed up with a faxed letter (bleep a DSN, 01245 362000)
- Individualised care with appropriate goals that may not be QoF friendly(avoid hypos)
- A small amount of basal may keep a non ketotic patient safe whilst you seek specialist help(holding measure only)
- Access to support(phone)
- Blood Ketone testing in Type 1 supported by appropriate education
- Early Podiatry intervention

Hypoglycaemia

- Management must be included in education package for patient
- Our recommendation on CCG website
- The message requires to be re-enforced
- Scope for further work with the ambulance service

Treating hypos what should I tell my patient?

Step 1

- Fast acting sugar (Gives a quick rise in blood glucose within 5-10mins) This should contain 10-20g of fast acting carbohydrate eg

10g CHO	**20g CHO**
3 Dextrose tablets	6 Dextrose tablets
Lucozade original 60ml	Lucozade original 120ml
Coke / Lemonade 150ml (non-diet)	Coke / Lemonade 300ml (non-diet)
3 jelly babies or wine gums	6 jelly babies or wine gums
1 tubes Hypostop / Glucogel	2 tubes Hypostop / Glucogel
200ml Orange juice	400ml Orange juice

NB If blood sugar < 3mmol/l may need to take a larger dose of fast acting sugar initially e.g.20g CHO such as 6 Dextrose tablets

Step 2

- After 10 minutes, **wash hands again** before testing as a sugary snack has been consumed!, test blood glucose to ensure it has risen above 4mmol/l. If it has not, take some more fast acting sugar e.g. another 3 dextrose tablets.

Step 3

Slow acting sugar is required to ensure the blood glucose levels does not drop again. This should be taken once the blood glucose level has risen above 4mmol/l. Aim for 10-15g carbohydrate of slow sugar e.g.

- 1 slice of bread
- 1 piece of fruit e.g. banana, apple, orange
- 1-2 digestive or rich tea biscuits
- Yoghurt
- 200ml milk
- Note: If hypo is just before a meal ensure use of fast acting sugar but replace snack with meal (must have CHO)

Hypoglycaemia:driving update

Insulin treated patients must;

- Carry monitoring kit and test 2 hourly
- BG> 5 mmols to drive
- If hypo whilst driving -- treat and do not resume for 45mins
- Read a number plate at 20metres
- If one or more hypo requiring assistance of another person in previous 12months -- DVLA notifiable driving License will be re-voked (group 1 & 2) Nocturnal included
- 3 months of BG readings for a downloaded meter(not log book)

When is admission necessary?

- DKA (new or existing T1)
- HONK(usually undiagnosed T2)
- Pregnancy related emergency
- Infected diabetic foot ulcer

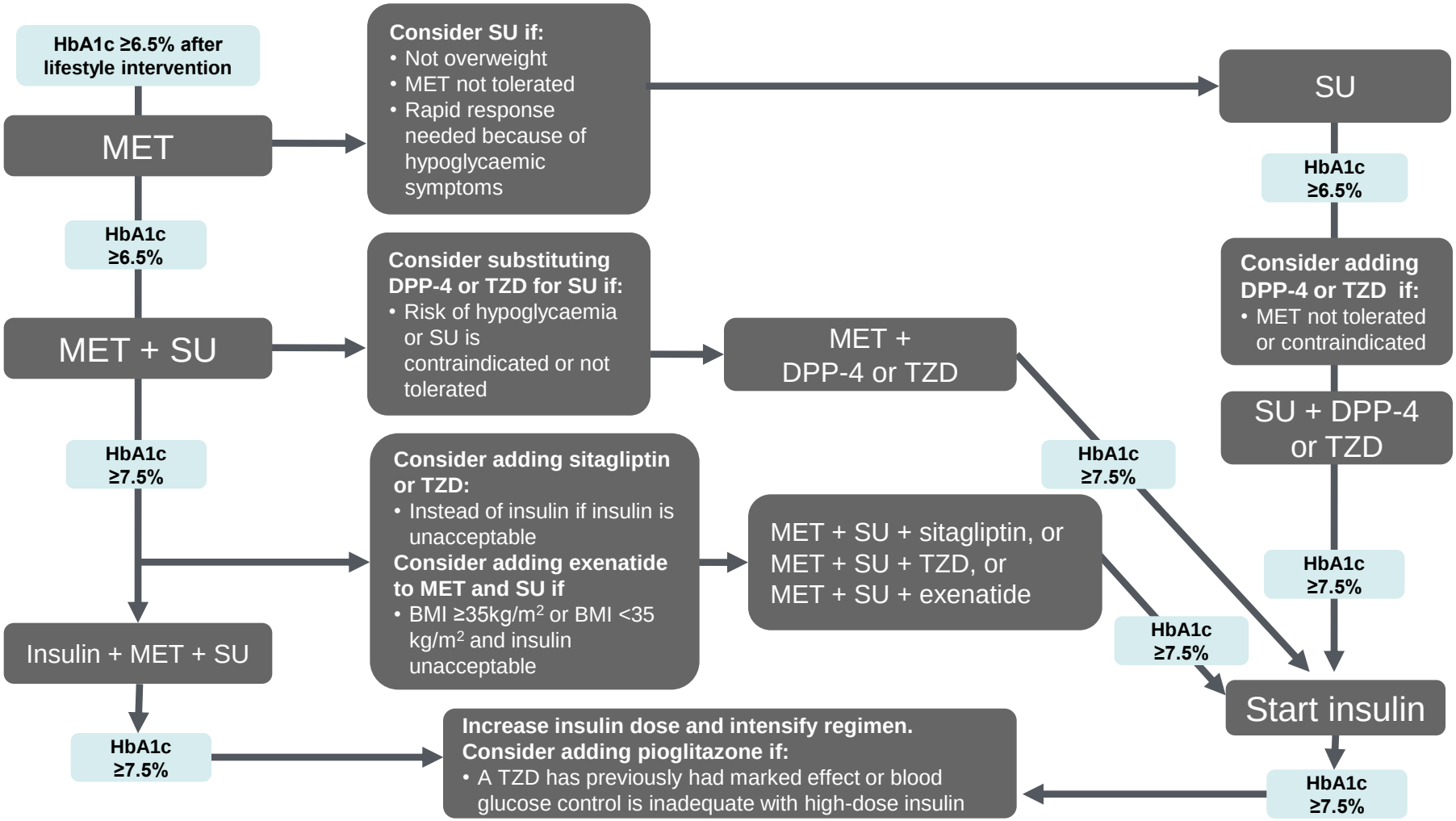
Troubleshooting HbA1c

Option appraisal

What should happen when a patient is diagnosed with T1or T2?

- Type 1 – HBGM, education, basal bolus regime , refer for CHO counting/ insulin adjustment and general support
- Type 2 follow NICE guidance, refer for structured education
- T1 & T2 :Give or ask patient to download hand held record from CCG website includes insulin passport

National Institute for Health and Clinical Excellence (NICE): T2D treatment algorithm[1]



MET = metformin, SU = sulphonylureas, TZD = thiazolidinedione, DPP-4= dipeptidyl peptidase-4 inhibitor

1. Adapted from: National Institute for Health and Clinical Excellence. Clinical Guideline 87. Type 2 diabetes - newer agents (a partial update of CG66): quick reference guide.

DPP-4
(dipeptidyl peptidase-4inhibitors

NICE CG87

- The use of Sitagliptin or Vildagliptin is recommended instead of an SU as second line therapy if BG control remains or becomes inadequate if the person is at significant risk of hypoglycaemia or its consequences

Barnett A, Brice R, hall G, Holt R, Kanumilli N, Mulnier H, 2010, " Nice technology Appraisal on liraglutide : Interpretation and practical implications. Supplement to Diabetes & primary care Vol 12, No 6

Glucagon – like peptide -1 receptor angonist or GLP -1

Modes of action (class effect)

- Acts by binding to and activating the GLP-1 receptor
- Increases glucose dependent insulin secretion from the pancreatic beta cells, as glucose concentrations decrease, insulin secretion subsides
- Suppresses inappropriately elevated glucagon levels
- Slows gastric emptying thus reducing the rate of which meal derived glucose appears in the circulation
- Patient should reach satiety sooner and thus eat less!
- Caution if eGFR 30-50mL/min , avoid if eGFR < 30mL/min/1.73m2

BYDUREON

- Alternative to other GLP-1 agonists in a weekly preparation (same day)
- BYDUREON is exenatide incorporated into polymer based microspheres.
- Following s/c injection the microspheres slowly biodegrade and release the exenatide gradually at a controlled rate over an extended period of time
- Therapeutic levels are achieved in 2 weeks and steady state is achieved at 6-7weeks
- Target patient=
- Cost for 28 days = £73.36
- Lower incidence of nausea then BD exenatide or 1.8mgs liraglutide
- Some problems with skin pruritus/nodules/erthema at injection sites

Compare and Contrast

	GLP-1	DPP-4
GLP-1 conc. in plasma	Supraphysiological levels of GLP-1 Not limited by endogenous secretion of GLP-1	Increased levels of GLP-1 in physiological range Limited by endogenous secretion of GLP-1
Effects on insulin & glucagon	++ insulin release when glucose elevated - -Glucagon release when glucose elevated	+ insulin release when glucose elevated -Glucagon release when glucose elevated
GI side effects	-Food intake - gastric emptying	No significant effect
Tolerability	Mild & transient nausea in 10-30% Low rates of hypo unless with SU	Low rates of hypos unless with SU or insulin (sitagliptin only)

Compare and contrast

	GLP-1	DPP-4
Method of administration	s/c injection	Oral
Approximate reduction in HbA1c in phase III clinical trails	~1.0-1.5% (~11-16mmols/mol)	~0-5-1-0% (~ 5-11mmol/mol)
Typical effect on body weight	Weight loss	Weight neutral

What currently guides choice of insulin?

- Aim of treatment
  - What are the goals of therapy (from HCP & patient perspective)

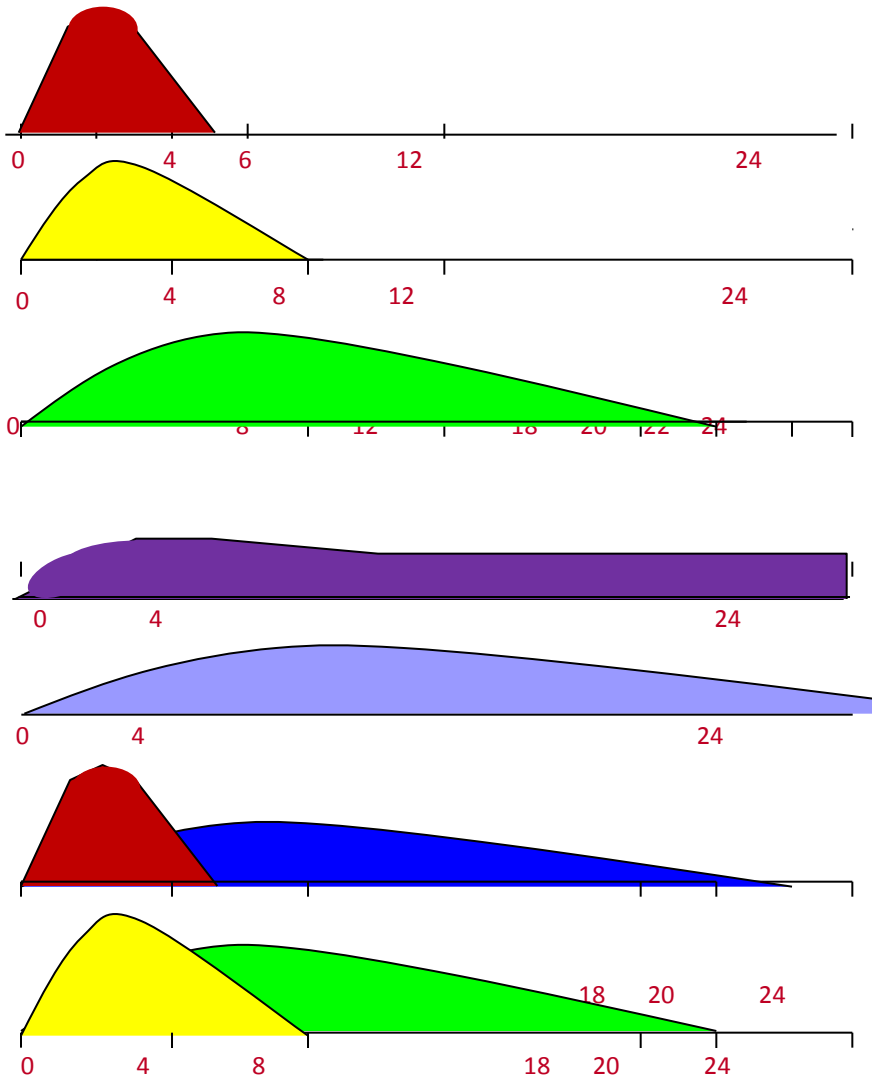
- Individual capabilities
  - Knowledge, skills and competence
- Lifestyle/social aspects
  - Dietary patterns, employment etc

- Patient choice (What does this actually look like ?)
  - Are patients given a choice re number of injections, pen devices, regimens?
  - Patients want to know the full information to be able to make an informed choice
  - Unless a treatment is asked for, it may not ever be offered. It was felt this amounted to gate keeping of information

Further points to consider when choosing insulin regimens in Type 2

- Not achieving goals of therapy
- Was failure of previous medication due to non-compliance/adherence
- Mismatched goals
- Weight gain
  - Variable depending upon regimen and pre-therapy state
- Availability or lack of, dietary support
- Hypoglycaemia
  - Risk is lower in type 2 diabetes

Onset and Duration of Insulin



Rapid-acting analogue
e.g. Humalog* (insulin lispro), NovoRapid, Apidra

Short-acting (soluble/regular)
e.g., Humulin S (Human insulin), Actrapid, Insuman Rapid

Intermediate acting (Isophane)
e.g. Insulatard, Humulin I (Isophane human), Insuman Basal

Long acting analogue
e.g. Lantus

or Levemir

Rapid acting analogue-intermediate mixture
e.g. Humalog Mix25 / Mix50 or NovoMix30

Short acting-intermediate mixture
e.g. **Humulin M3,**
Insuman Comb 15, 25, 50

4-T study: 3 year efficacy of complex insulin regimens in Type 2 diabetes

- Sponsored by Novo Nordisk, independently designed run and reported by an academic group (Oxford)
- 1 year results published in 2007
- First phase
  - 1 yr head to head comparison of the efficacy of 3 different types on insulin (Prandial Insulin Aspart (Novorapid) three times daily, biphasic insulin aspart (NovoMix 30) twice daily, basal insulin detimir (Levemir) once daily (twice if required))
- 3 yr study in 708 Type 2s in 58 UK / Irish centres
- Second phase
  - Evaluation over 2 further years for the need for more complex insulin regimens and overall efficacy of insulin strategies above

Holman RR. et al, New England Journal of Medicine 2007;357: 1716-30

4-T study: 3 year efficacy of complex insulin regimens in Type 2 diabetes[7]

- Demographics
- No difference between 3 groups
  - Age , Duration of diabetes, BMI,
  - HbA1c, Concomitant OHA's

Results

- No statistically difference in median HbA_{1c} between groups
  - Differences in proportions reaching target level
- Hypos lowest in basal group
- Weight gain highest in prandial group
- % of patients who required intensification using a second insulin:-
  - 67.7% for biphasic
  - 73.6% for prandial
  - 81.6% for basal

Determinants of success

Appropriate insulin regimen

- A need for more evidence in Type 2 diabetes
- Therefore the choice of insulin should be based on presumed likelihood of success.

Appropriate dose titration

- Empowerment for self titration with appropriate instruction
- Pt confidence in self adjustment

Compliance/concordance with treatment

Updates

Acute coronary syndromes(ACS)

- Defined as “ *a spectrum of unstable coronary artery disease , ranging from unstable angina to transmural myocardial infarction”*
- *The underlying cause of all categories of ACS is an inflammatory process within the blood vessels , the formation of fatty deposits (atheromatous plaques) which blood clots then adhere to.*

Hyperglycaemia

- Common in patients admitted with ACS
- 65% of patients with AMI , not know to have diabetes had positive impaired glucose regulation on OGTT
- It is a powerful predictor of poorer survival and ↑risk of complications whether the patient has diabetes or not
- Persistently elevated BG during AMI is associated with ↑hospital mortality , better predictor than admission glucose
- Not always treated
- Post DIGAMI (1&2) we still need to take this seriously

Nice Clinical Guideline 130, October 2011

Recommendations

Hyperglycaemia in the first 48hours of ACS

- Keep BG levels below 11mmol/litre but avoid hypoglycaemia, consider S/S
- Do not routinely offer intensive insulin therapy (ie insulin, glucose infusion ± K+) to manage BG>11mmol/litre unless clinically indicated

Identifying patients with Hyperglycaemia after ACS who have a risk of developing diabetes

- HbA1c before discharge
- Fasting BG levels no earlier than 4 days after onset of ACS
- Do not routinely offer OGTT to patients with hyperglycaemia after ACS , without known diabetes, if HbA1c and FBG are normal

Recommendations
(not know diabetes)

Advice and ongoing monitoring

- Lifestyle advice on healthy eating , exercise, weight management smoking cessation and alcohol consumption
- Increased risk of T2DM
- Patient to Consult GP if they experience osmotic symptoms
- GP should be offer annual test for diabetes(annual HbA1c and FBG

Summary :Implications for practice

- Within first 48 hours of ACS keep BG < 11mmol/litre with standard S/S
- Do not routinely use previous insulin , glucose infusion (digami) with K+ supplements unless a clear indication
- HbA1c before discharge , FBG after 4days
- General lifestyle education and ongoing surveillance on an annual basis by GP/PN

Mid Essex Integrated Diabetes Service

Consultant led: Diabetes Centre

- Pregnancy, pre-conceptual
- Renal, Acute foot care
- Young Type 1 and adolescent/ transition
- Insulin pumps, CGMS
- Award winning Structured education in Type 1(BERTIE)
- Complex T2 (2+ complications)
- Education
- Telephone / admission avoidance

Tier 2:Community wide, GPwSI supported

- One stop shop for glycaemic intensification
- Insulin conversions, group and “one to one”
- Newer therapies
- Straightforward Type 1
- Structured education for T2(CREDIT) Maldon monthly, B, W & C’Ford alternate
- Primary care support
- Education/telephone support

Joint British Diabetes Societies
Inpatient Care Group

The Management of Diabetic Ketoacidosis in Adults

March 2010

DKA

- incidence: 4.6 to 8 episodes per 1,000 patients with diabetes
- cerebral oedema remains the most common cause of mortality, particularly in young children and adolescents
- the main causes of mortality in the adult population include:
  - severe hypokalaemia
  - adult respiratory distress syndrome
  - co-morbid states such as pneumonia, acute myocardial infarction and sepsis

Definition

- DKA consists of the biochemical triad of ketonaemia, hyperglycaemia, and acidaemia
  - ketonaemia ≥ 3 mmol/L, or significant ketonuria (> 2+ on standard urine sticks)
  - blood glucose >11 mmol/L, or known diabetes
  - $HCO3^-$ < 15 mmol/L and/or venous pH < 7.3

0 to 60 minutes

- Action 1 - IV access and initial investigations
- Action 2 - restoration of circulating volume
  - systolic BP <90: 500-1000ml 0.9% saline stat
  - systolic BP >90: see chart
- Action 3 - potassium replacement (see chart)
- Action 4 - commence a **fixed rate intravenous insulin** infusion (IVII)
  - start continuous fixed rate IVII via an infusion pump
  - 50units human soluble insulin (Actrapid, Humulin S) made up to 50ml with 0.9% sodium chloride solution.
  - **infuse at a fixed rate of 0.1unit/kg/hr** (i.e. 7ml/hr if weight is 70kg)

60 minutes to 6 hours

- Action 2 - review metabolic parameters
  - Measure blood ketones and capillary glucose hourly
  - Measure venous blood gas for pH, bicarbonate and potassium at 60 minutes and 2 hours and 2 hourly thereafter
- if blood ketone not falling by at least 0.5 mmol/L/hr
  - check the insulin infusion pump is working and connected
  - increase insulin infusion rate by 1 unit/hr increments hourly until ketones falling at target rates
- Continue fixed rate IVII until ketones < 0.3 mmol/L, venous pH > 7.3 and/or venous bicarbonate > 18 mmol/L
- Action 1 - re-assess patient, monitor vital signs
- If glucose falls < 14 mmol/L start 10% glucose at 125mls/hour alongside the 0.9% saline
- Action 3 - identify and treat precipitating factors

Key messages

- Differential diagnosis T1 v T2
- Basic education for patients new to diabetes in all practices
- Refer early not late
- Don’t hang on to patients if you are not sure

Test your knowledge

Try to undertake a self assessment!

- *www.diabetes.nhs.uk/**safe_use_of_insulin/elearning**__course/ -*
- Any questions?